

Creating a Periodic Table

Commander: _____

Scribe: _____

Chemist: _____

You are a member of a team in a space ship investigating life in another solar system; you and your team examine some substances that resemble rocks and minerals. Your team has instruments to measure the atomic mass, the melting point, and the density of a substance. You also have a set of chemicals designated C1, C2, C3, and C4.

Your experiments lead you to believe that all substances consist of 12 elements, even though you are able to purify only 11 elements. Your team needs to assign each element a name and symbol based on the zodiac. Your team must measure the melting point, the atomic mass, and the density of each element and test it with all 4 chemicals. All this information is recorded below.

Your goal is first to organize into three roles: A Commander, a scribe, and a Chemist. The job of the commander is to read all of the instructions to the team and make sure that the periodic table is organized appropriately. The commander must also make sure that the team agrees on all the answers to the questions. If the mission does not succeed you may lose your role as commander.

The scribe's job is to record the final periodic table, record all the answers to the questions, and insure that each team member can copy the correct table. They must also move the tiles around as directed by the chemist and the commander.

The chemist's job is to organize, with the aid of the commander, the tiles as directed in the instructions. The chemist must understand and be able to explain to the scribe why the tiles are organized the way they are.

Experimental results:

1. Aquarius (Aq) yellow solid, 250°C, 9.4 u, 3.1 g/ml, reacts only with C3 to form a yellow-red solution.
2. Aries (Ar) black solid, 290°C, 11.8 u, 4.0 g/ml, does not react with any chemicals.
3. Cancer (Cn) silver solid, 400°C, 32.3 u, 6.1 g/ml, does not react with any chemicals.
4. Capricorn (Cp) white solid, 100°C, 3.1 u, 2.5 g/ml, reacts with C1 and C2 to form a white precipitate.
5. Gemini (Ge) turquoise solid, 250°C, 16.5 u, 3.5 g/ml, reacts with both C2 and C4 to produce a colored solution.
6. Leo (Le) red solid, 380°C, 29.1 u, 5.0 g/ml, reacts only with C3 to form a yellow-red solution.

7. Libra (Lb) green solid, 320°C, 27.2 u, 4.5 g/ml, reacts with both C2 and C4 to produce a colored solution.
8. Pisces (Pi) blue solid, 200°C , 6.2 u, 2.7 g/ml, reacts with both C2 and C4 to form a colored solution.
9. Taurus (Ta) grey solid, 330°C, 20.9 u, 5.0 g/ml, does not react with any chemicals.
10. Scorpio (Sc) grey solid, 160°C, 14.1 u, 3.0 g/ml, reacts with both C1 and C2 to form a white precipitate.
11. Sagittarius (Sa) silver solid, 250°C, 25.1 u, 4.1 g/ml, reacts with both C1 and C2 to produce a white precipitate.

Tasks

1. With your team, try to figure out the best way to organize these elements. It may be much easier if you use the paper slips that your instructor has provided. Consider both physical and chemical properties in your organization of the elements.
2. Once you have constructed a periodic table of elements, use graph paper to plot the density values for each element. Connect the points, but leave a gap if there is missing data.
3. Plot a similar graph using the melting points of all the elements.

Discussion

1. Which of the given pieces of information were physical properties and which were chemical?
2. Describe the pattern of your density and melting point graphs.
3. Predict the density and melting point of the missing element.
4. Can you predict the atomic mass of the element?
5. What color would you expect the missing element to be? Why?
6. How do you expect the missing element to react with chemicals C1, C2, C3, and C4?
7. Select a name for this missing element and create a symbol.
8. Draw a complete periodic table based on the 12 elements in this activity on a separate piece of paper. Attach it and your graph to back of packet after Mr. Golden has checked it off.

(In reality, constructing a periodic table is not always this easy!)

